

Books

Visual Cues: Practical Data Visualization, Peter R. Keller and Mary M. Keller, IEEE Computer Society Press, 1993. 229 pp. (ISBN 0-8186-3102-3).

While attending the SIGGRAPH '93 conference in Anaheim, CA, I noticed this volume on the IEEE book stand and flicked through the many pages of visualizations. It was immediately obvious that the book would be useful to anyone supporting users of visualization software and to researchers searching for new ways to express their data.

In the comfort of my office the book lives up to those first impressions. However, it is more than just a collection of pretty pictures. There are three main sections: an introduction to visualization, a section of numerous examples, and a selection of useful appendices to aid the reader in accessing the information in the examples. To the visualization user this book is like a manual for home design, with plenty of practical ideas to draw upon and use "as is" or to develop further.

The introductory section is aimed at the practicalities of data visualization rather than detailed discussions of algorithms. Such a review is extremely useful, not only for the newcomer but also for the experienced practitioner. When one is building effective images to illustrate findings in data, there are always ideas to be drawn from the experiences of others. The first 33 pages of this book provide an interesting review of practical topics such as techniques selection, output media, image design, and colour—information that users at any level of experience will find thought-provoking.

All too often in a given discipline, images follow the same format and techniques that have become the *de facto* standard of the subject. This can build mental roadblocks to new techniques. As an aid to the removal of such blocks, the authors

discuss the need to treat data as sets of numbers, rather than to be confined by the structure and dimensionality of the data sets. Two other key processes are discussed in choosing the correct techniques for effective visualization: know the goal of the image, and know whether it will be displaying data or phenomena.

Knowing the goal can be an evolutionary process (as the authors point out) during the exploration of data. Basic decisions about what one is trying to achieve must still be made during exploration. This book gives guidance on where to start and what is likely to succeed. Using the extensive appendices, the reader is able to make decisions based on a taxonomy of visualization that classifies actions and data, such as "identify scalar" or "compare structure." As a method of guiding users through the wide choice of visualization techniques, this taxonomy is a valuable tool. No doubt other authors would come up with different taxonomies, but in the absence of a fixed set of rules, the scheme presented here is certainly workable.

What is actually being displayed and investigated is a topic that is often overlooked. The authors make the distinction between *data* (for example, surface temperatures) and *phenomena* (for example, coastlines). Phenomena place the data in context and allow viewers to understand the visualization without undue explanation. The introductory discussion includes a set of checklists on a variety of visualization topics such as output media, image components, and colour. The section on output media is extremely useful for the beginner, but also serves to remind experienced visualization developers of the need to consider the final output form when composing an image. Useful discussion in this section includes advice

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on film processing in relation to shot sequences and a reminder that, in most conference rooms, landscape format slides and transparencies show better than those with portrait format. (In other words, slides show better with the long edge horizontal rather than vertical.)

Colour is given more extensive treatment in the discussion text than other topics, which is highly appropriate. Again a checklist of good practice is provided as a memory aid for users. Practical advice and warnings are given, as opposed to an in-depth examination of colour science. Such advice is often difficult to obtain in the concise form given in this book.

The majority of the book is given over to an extensive collection of full-colour images of data visualization. Each is presented on a single page with text detailing the application, techniques used, and hints to understanding. Also included on the page are suggested references for further reading and a classification of the data displayed. Many of the images used are straightforward in what they show and are therefore good illustrations of particular points about techniques and methods of data visualization. As a source of ideas, this presentation style works very well. One can browse the book and pause at items of interest, or choose a classification from the appendices to associate with the examples. Excellent cross-references allow readers to examine related examples without having to manually search the book. The examples come from many contributors and the editors deserve praise for the tenacity they undoubtedly showed in gathering and collating the information.

This book is a valuable addition to the bookshelf of anyone involved in data visualization, whether in a support role or as an active researcher. The introductory chapters serve to set the book in context and present the ideas toward a set of practical rules for visualization. Overall it is a book that should be well used, not read and assigned to bookshelf packing.

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